BASIC THERMODYNAMICS		Semester	III
Course Code	BIP301	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- Define work, heat, and laws of thermodynamics.
- Displacement work and statement of First law of Thermodynamics
- Expression for SSFEE and Kelvin-Planck statement of the Second law of Thermodynamics, Evaluate thermal performance of refrigeration cycles
- Demonstrate the calculation of efficiency of gas power and vapour power cycles.
- Testing of two stroke and four stroke SI and CI engines and Van-der Waal's Equation of state

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Industrial and Production Engineering structures.
3. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
4. Encourage collaborative (Group Learning) Learning in the class.
5. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
10. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Fundamental Concepts & Definitions: Thermodynamics definition and scope, Some practical applications of engineering thermodynamic Systems, Characteristics of system boundary and control surface. Microscopic and Macroscopic approaches. Thermodynamic properties; definition and units, intensive and extensive properties, Thermodynamic equilibrium; definition, mechanical equilibrium, thermal equilibrium, chemical equilibrium. Types of process, quasi-static process. Zeroth law of thermodynamics, Temperature concepts.

Work and Heat: Definition of work. Thermodynamic definition of work; examples, sign convention, work is a path function. Definition of heat, sign convention, heat is a path function, comparison of work heat.

Module-2

Displacement work; as a part of a system boundary, as a whole of a system boundary, expressions for displacement work in various processes through p-v diagrams.

First Law of Thermodynamics: Joules experiments, equivalence of heat and work. Statement of the First law of thermodynamics, extension of the First law to non - cyclic processes, energy, energy as a property, modes of energy, pure substance; definition, two-property rule, Specific heat at constant volume, enthalpy, specific heat at constant pressure.

Module-3

Application of First Law of Thermodynamics: Extension of the First law to control volume; steady state-steady flow energy equation, important applications, analysis of unsteady processes such as film and evacuation of vessels with and without heat transfer.

Second Law of Thermodynamics: Limitation of first law of thermodynamics, Qualitative difference between heat & work; Cyclic heat engine; Energy Reservoirs; Kelvin-Planck statement of the Second law of Thermodynamics; Clausius's statement of Second law of Thermodynamics; (Equivalence of two statements not included)

Module-4

Gas power cycle: Air Standard cycles: Carnot, Otto, Diesel, Dual and Stirling cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures, Comparison of Otto, Diesel and dual cycles. Introduction To Gas Turbine And Its Classification.

Module-5

I.C. Engine: Testing of two stroke and four stroke SI and CI engines for performance Related numerical problems, heat balance, Motoring Method, William's line method, swinging field dynamometer, Morse test. Real

Gases: Introduction. Van-der Waal's Equation of state, Vander Waal's constants in terms of critical properties,Law of corresponding states, compressibility factor; compressibility chart.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

1. Define work, heat, and laws of thermodynamics.
2. Displacement work and statement of First law of Thermodynamics
3. Expression for SSFEE and Kelvin-Planck statement of the Second law of Thermodynamics, Evaluate thermal performance of refrigeration cycles
4. Demonstrate the calculation of efficiency of gas power and vapour power cycles.
5. Testing of two stroke and four stroke SI and CI engines and Van-der Waal's Equation of state

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

Textbooks

1. Basic Engineering Thermodynamics, A.Venkatesh Universities Press, 2008
2. Basic and Applied Thermodynamics, P.K.Nag Tata McGraw Hill Pub 2nd Ed., 2002
3. Fluid Mechanics and Fluid Power, Kumar.D.S, Kataria and Sons, 2004
4. Fluid Mechanics Dr.BansalR.K.Lakshmi Publications 2004

Reference Books

5. Thermodynamics, An Engineering Approach, Yunus A. Cenegal and Michael A.Boles, Tata McGraw Hill publications 2002
6. Engineering Thermodynamics, J.B.Jones and G.A.Hawkins, John Wiley and Sons
7. Fundamentals of Classical Thermodynamics, G.J.VanWylen and R.E.Sonntag , Wiley Eastern.
8. Fluid Mechanics and hydraulics, Dr.Jagadishlal Metropolitan Book CoLtd., 1997
9. Fluid Mechanics (SI Units), Yunus A. Cingel John M.Oimbala Tata Mac GrawHill 2006
10. Fluid Mechanics John F.Douglas, Janul and M.Gasiosek and john A.Swaffield Pearson Education Asia 5th ed., 2006

Web links and Video Lectures (e-Resources):

http://mhhe.com/nag/et
https://www.sfu.ca/~mbahrami/ENSC%20388/Notes/Intro%20and%20Basic%20Concepts.pdf
https://www.youtube.com/watch?v=6QXtnmB1vqk
https://www.youtube.com/watch?v=F7L4ZCWtp94
https://www.youtube.com/watch?v=sA99mw3D2Ds
https://archive.nptel.ac.in/courses/112/105/112105171/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Contents related activities (Activity-based discussions)
- For active participation of students, instruct the students to prepare Exercise problems
- Organizing Group wise discussions and machineries issues based activities
- Quizzes and Discussions
- Seminars and assignments

Material Science and Metallurgy		Semester	III
Course Code	**BIP302**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	**Theory**		

Course objectives:

- The foundation for understanding the structure and behavior of materials common in mechanical engineering.
- Topics to explore the mechanical properties of metals and their alloys, polymers, ceramics, smart materials and composites
- To understand modifications of material properties by heat treatment processes
- Selections of different materials for various applications are highlighted
- Impart knowledge of various failure modes of materials

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Videos/animation films to explain the content, wherever possible.
3. Encourage collaborative Learning (Group Learning) in the class.
4. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Show the different ways to solve the same problem and encourage the students to adopt creative ways to solve them.
7. Discuss how every concept can be applied to the real world thus helping to improve the student's understanding.
8. Individual teachers can device innovative pedagogy to improve teaching-learning.

MODULE-1

Crystal Structure

Unit Cells, Crystal systems, BCC, FCC, and HCP structures, Coordination number and atomic packing factors
Crystal Imperfection-Point, line and surface imperfections

Atomic Diffusion

-Fick's laws of diffusion, Factors affecting Diffusion, Steady and non-steady state diffusions

Dislocation

Characteristics of dislocations slip systems, slip in single crystals, Plastic deformation of polycrystalline materials, Deformation by twinning

MODULE-2
Fracture Types of fracture, ductile and brittle fracture, Ductile to brittle transition temperature, mechanism of fracture(Griffith's theory) **Fatigue** Fatigue test, SN curves,fatigue properties, Factors affecting fatigue life **Creep** Creep curve, Mechanism of creep, creep properties, creep testing
MODULE-3
Phase Diagrams Solid solutions, Hume Rothary rules, substitutional, and interstitial solid solutions, Intermediate phases, Gibbs phase rule, types of phase diagram- solid solution, eutectic system, peritectic, eutectoid transformation, peritectoid transformation, monotectic and syntactic reation, Construction of equilibrium diagrams, lever rule. Iron carbon equilibrium diagram Description of phases, Solidification of steels and cast irons, Invariant reactions, TTT curves, Continuous cooling curves
MODULE-4
Heat Treatment of Metals Annealing and its types, normalizing, Hardening, Hardenability, tempering, Martempering, Austempering, surface hardening methods like carburizing, cyaniding, Nitriding, Flame hardening and induction hardening. Age hardening of Aluminium –Copper alloys **Recovery, Recrystallization and Grain Growth** Recrystallization temperature, Annealing temperature v/s cold-worked and recovered grains, Direction of grain boundary motion.
MODULE-5
Steels and cast irons Ferrous alloys, steels – low medium and high carbon, AISI designation steels, Cast irons – types and properties, Composites and ceramics **Composite materials:** Definition, classification, Types of matrix materials & reinforcements, Application of composites, Ceramics, Glasses, Glass – ceramics, clay products, Refractories, abrasives and cements.

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Tensile test of metallic and non metallic specimens using Universal Testing Machine
2	Shear test of metallic and non metallic specimens using Universal Testing Machine
3	Compression test of metallic and non metallic specimens using Universal Testing Machine
4	Bending Test on metallic and nonmetallic specimens
5	Charpy Tests on M.S and C.I Specimen
6	Izode Tests on M.S and C.I Specimen
7	Brinell, Rockwell and Vickers's Hardness test.
8	To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.
Demonstration only	
9	Fatigue Test
10	Preparation of specimen for Metallographic examination of different engineering materials. Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.
11	Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of Heat treated samples
12	Torsion Test

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

- Understand the mechanical properties of metals and their alloys.
- Analyze the various modes of failure and understand the microstructures of ferrous and nonferrous materials.
- Describe the processes of heat treatment of various alloys.
- Acquire the Knowledge of composite materials and their production process as well as applications
- Understand the properties and potentialities of various materials available and material selection procedures.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two

Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

5. The question paper will have ten questions. Each question is set for 20 marks.
6. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
7. The students have to answer 5 full questions, selecting one full question from each module.
8. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. "An Introduction -Material's Science and Engineering", William D Callister, John Wiley and Sons India Pvt Ltd., 6th Edition, 2006 New Delhi
2. Foundation of Material Science and Engineering, Smith, McGraw Hill, 3rd Edition, 1997

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=iyJvxOLq02s
- https://www.youtube.com/watch?v=wzZlB75j-Ks
- https://www.youtube.com/watch?v=P3pHya6S5t0
- https://www.youtube.com/watch?v=cpvTwYAUeA8
- https://www.youtube.com/watch?v=lH5Ab-RMSpY
- https://www.youtube.com/watch?v=1wWd8zFizHY
- https://www.youtube.com/watch?v=PV1vPAkNMPw
- https://www.youtube.com/watch?v=MJoYwtX_zFA
- https://www.youtube.com/watch?v=7hmF3WoQkTg
- https://www.youtube.com/watch?v=vAvLiihHe58

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
At the end of the lecture/presentation, assignments are to be given under each of the topics covered.

Production Engineering - I		Semester	III
Course Code	**BIP303**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	**Theory**		

Course objectives:

- Define various terms associated with casting processes
- Explain methods of construction of moulds.
- Select moulding machine and moulding process based on material type
- Select appropriate joining process, type of joints.
- Explain different non-destructive testing method

Teaching-Learning Process (General Instructions)
These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type ofteaching method may be adopted to develop the outcomes.
2. Show Videos/animation films to explain the content, wherever possible.
3. Encourage collaborative Learning (Group Learning) in the class.
4. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Discuss how every concept can be applied to the real world thus helping to improve the studentsunderstanding.
6. Individual teachers can device innovative pedagogy to improve teaching-learning.

MODULE-1

CASTING PROCESS

Introduction: Concept of Manufacturing process, its importance. Classification of Manufacturing processes.Introduction to Casting process &steps involved. Varieties of components produced by casting process.Advantages& Limitations of casting process.

Patterns: Definition, functions, Materials used for pattern, various pattern allowances and their importance, Classification of patterns.

Sand Moulding: Types of base sand, requirement of base sand. Moulding sand mixture ingredients for different sand mixtures. Method used for sand moulding, such as Green sand, dry sand and skin dried moulds.

Binder: Definition, Types of binder used in moulding sand. Additives: Need, Types of additives used and their properties.

MODULE-2

Cores: Definition, Need, Types. Method of making cores, Binders used, core sand moulding.

Concept of Gating & Risers: Principle and types. Fettling and cleaning of castings. Basic steps, Casting defects, Causes, features and remedies.

Moulding Machines: Jolt type, Squeeze type, Jolt & Squeeze type and Sand slinger.

Special moulding Process (Only brief Introduction): No bake moulds, Flask less moulds, Sweep mould, CO_2mould, Shell mould, Investment mould.

Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Squeeze Casting, Slush casting, Thixo-casting and Continuous Casting Processes.

MODULE-3

Melting Furnaces: Constructional features &working principle of coke fired, oil fired and Gas fired pit furnace.(Only brief Introduction) Resistance furnace, Coreless Induction furnace, Electric Arc Furnace, Cupola furnace.

Forging: Introduction, Merits, Smith forging operations, Types of forges and heating furnaces, Introduction to forging presses, Upset/machine forging, Forging defects.

MODULE-4

WELDING

Welding process: Definition, Principles, Classification, Application, Advantages& limitations of welding.

Arc Welding: Principle, Metal Arc welding (MAW), Flux Shielded Metal Arc Welding (FSMAW), Inert Gas Welding (TIG & MIG) Submerged Arc Welding (SAW) and Atomic Hydrogen Welding processes (AHW).

Gas Welding: Principle, Oxy – Acetylene welding, Chemical Reaction in Gas welding, Flame characteristics. Gas torch construction &working. Forward and backward welding.

MODULE-5

Special types of welding: Resistance welding - principles, Seam welding, Butt welding, Spot welding and projection welding. Friction welding, Explosive welding, Thermit welding, Laser welding and Electron beamwelding.

Inspection Methods: Methods used for Inspection of casting and welding. Visual, Magnetic particle, Fluorescent particle, Ultrasonic, Radiography, Eddy current, Holography methods of Inspection.

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Preparation of molds using two molding boxes using patterns or without patterns. (Split pattern, Match plate) by using foundry tools and other equipment.
2	Preparation of simple welded joints like Lap, Butt, T-welds, L-welds using Arc and Gas welding process.
3	Preparing minimum three forged models involving upsetting, drawing and bending operations. Out of these three models, at least one model is to be prepared by using Power Hammer
Demonstration only	
4	Preparation of one casting (Aluminium or cast iron)
5	Testing of Moulding Sand and Core Sand: Preparation of sand specimens and conduction of the following tests: a) Compression, Shear and Tensile tests on Universal Sand Testing Machine. b) Permeability test c) Core hardness &Mould hardness tests. d) Sieve Analysis to find Grain Finest number of Base Sand e) Clay content determination in Base Sand

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

- Define various terms associated with casting processes.
- Explain methods of construction of moulds, different non-destructive testing methods.
- Select moulding machine and moulding process based on material type.
- Define various steps associated with forging process.
- Select appropriate joining process and type of joints.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**

- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Production engnineering I by Hajrachoudary
2. Manufacturing Process-I by Dr.K. Radhakrishna,Sapna Book House 5th Revised Edition 2009.
3. Manufacturing & Technology Foundry Forming and Welding by P.N.Rao, Tata McGraw Hill 3rd Ed., 2003
4. Process and Materials of Manufacturing by Roy A Lindberg Pearson Education 4th Edition, 2006
5. Manufacturing Technology by SeropeKalpakjian, Steuen. R. Sechmid Pearson Education Asia 5th Edition, 2006

Web links and Video Lectures (e-Resources):

https://youtu.be/cBWavCXbKMo
https://youtu.be/tB2ga9mISks
https://youtu.be/1oZnxZj6-Ig
https://youtu.be/EIBDp6U8bHo
https://youtu.be/jeQw-MrlXR4
https://youtu.be/IEVvFueCq0s
https://youtu.be/fL8ysJj3m7Y
https://youtu.be/aeSCjRaV9Og
https://youtu.be/Nao_mLIh5dk
https://youtu.be/twUAa5LWUvk

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Make the students to cast a material using wax with sand casting technique in lab.
2. Take the students to nearest foundry industry.
3. Group discussion and quiz on the subject in class.

FLUID MECHANICS		Semester	III
Course Code	BIP304	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- Define fluid properties; describe Pascal's law, Hydrostatic law.
- Calculate total pressure given point and between sections of pipe, Buoyancy and Stability of floating objects.
- Discuses fluid properties and fluid statics, calculate, Buoyancy, Stability of floating and Fluid Dynamics.
- Types of fluid flow, apply Bernoulli's principle to solve fluid flow problems.
- Discusses Major and Minor losses, expression for drag and lift

Teaching-Learning Process (General Instructions)
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Industrial and Production Engineering structures.
3. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
4. Encourage collaborative (Group Learning) Learning in the class.
5. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
10. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Properties of Fluids: Introduction, Properties of fluids, viscosity, thermodynamic properties, surface tension, capillarity, vapour pressure and cavitation's
Fluid Statics: Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge,Atmospheric and vacuum pressures, simple manometers and differential manometers. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined plane surfaces, curved surface submerged in liquid.

Module-2

Buoyancy and Fluid Kinematics: Buoyancy, center of buoyancy, metacentre and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of Metacentric height theoretically.
Kinematics: Types of fluid flow, continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration

Module-3

Fluid Dynamics: Introduction equation of motion, Euler's equation of motion, Bernoulli's equation from firstprinciples and also from Euler's equation, limitations of Bernoulli's equation.

Fluid Flow Measurements : Venturimeter, orifice meter, pitot-tube, vertical orifice, V Notch and rectangular notches

Module-4

Flow through pipes: Minor losses through pipes. Darey's and Chezy's equation for loss of head due to friction in pipes. HGL and TEL (no problems).
Flow past immersed bodies : Drag, Lift, expression for lift and drag, boundary layer concept, displacement, momentum and energy thickness

Module-5

Dimensional Analysis : Introduction, derived quantities, dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham π theorem, dimensionless numbers, similitude(theory and no problems)
Introduction to compressible flow: Velocity of sound in a fluid, Mach number, Mach cone, propagation of pressure waves in a compressible fluid on plates.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

1. Define work, heat, and laws of thermodynamics.
2. Evaluate thermal performance of temperature and work and heat.
3. Discuses fluid properties and fluid statics, calculate, Buoyancy, Stability of floating and Fluid Dynamics.
4. Types of fluid flow, apply Bernoulli's principle to solve fluid flow problems.
5. Discusses Major and Minor losses, expression for drag and lift

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

Textbooks

1. Fluid Mechanics and Fluid Power, Kumar.D.S, Kataria and Sons, 2004
2. Fluid Mechanics Dr.BansalR.K.Lakshmi Publications 2004

Reference Books

3. Fluid Mechanics and hydraulics, Dr.Jagadishlal Metropolitan Book CoLtd., 1997
4. Fluid Mechanics (SI Units), Yunus A. Cingel John M.Oimbala Tata Mac GrawHill 2006
5. Fluid Mechanics John F.Douglas, Janul and M.Gasiosek and john A.Swaffield Pearson Education Asia 5th ed., 2006

Web links and Video Lectures (e-Resources):

http://mhhe.com/nag/et
https://www.youtube.com/watch?v=F7L4ZCWtp94
https://www.youtube.com/watch?v=sA99mw3D2Ds
https://archive.nptel.ac.in/courses/112/105/112105171/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Contents related activities (Activity-based discussions)
- For active participation of students, instruct the students to prepare Exercise problems
- Organizing Group wise discussions and machineries issues based activities
- Quizzes and Discussions
- Seminars and assignments

Computer Aided Component Drawing		Semester	**III**
Course Code	**BIPL305**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	100
Examination type (SEE)	**Practical**		

Course objectives:

- Use tools of drafting and modeling software
- Draw the sections of solids, orthographic views of simple machine parts using software
- Sketch and explain various thread forms and their application.
- Calculate parameters related to riveted joints and sketch them.
- Create solid models and draw the sectional views of automotive systems..

Sl.NO	**Experiments**
1	**Sections of Solids:** Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones
2	**Orthographic views**: Conversion of pictorial views into orthographic projections of simple machine parts with or without section.
3	**Thread forms:** Thread terminology, forms of threads – BSW Thread, Sellers thread, ISO Metric thread, square and Acme thread. Conventional representation of threads.
4	**Fasteners:** Hexagonal headed bolt and nut with washer (assembly), square-headed bolt and nut with washer (assembly).
5	**Keys, cotter and knuckle joints:** Types of Keys, Cotter and knuckle Joints

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

- Use tools of drafting and modeling software
- Draw the sections of solids, orthographic views of simple machine parts using software
- Sketch and explain various thread forms and their application.
- Calculate parameters related to riveted joints and sketch them.
- Prepare assembly drawing from the list of components.
- Create solid models and draw the sectional views of automotive systems.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are**50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted

jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

1. Machine Drawing K. R. Gopala Krishna Subhash Publication.
2. A Primer on Computer Aided Machine Drawing Published by VTU
3. A Text Book of Computer Aided Machine Drawing S. Trymbaka Murthy CBS Publishers, New Delhi 2007
4. Machine Drawing with Auto CAD Goutam Purohit & GouthamGhosh 1st Indian print Pearson Education, 2005

Engineering Science Course/Emerging Technology Course/ Programming Language Course (ESC/ETC/PLC)

Advanced Joining Process		Semester	III
Course Code	**BIP306A**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- To know the different types of welding and describe welding and cladding of dissimilar metal
- To distinguish the weldability of metal
- To identify the welding design principles and compute welding design parameters
- To illustrate the symbols used in welding practice and identify the adhesive bonding applications

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Industrial and Production Engineering structures.
3. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
4. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
5. Encourage collaborative (Group Learning) Learning in the class.
6. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
7. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
8. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

Module-1

Types of Welding: Forge welding, Electro Slag Welding, Electron Beam Welding, Plasma arc Welding, Laser Beam Welding, Explosion Welding, Diffusion Welding, Ultrasonic Welding, Friction welding.

Welding and Cladding of Dissimilar Materials: Overlaying and surfacing, different methods and applications, thermal –Spray coating or metalizing.

Module-2
Weldability of Metals: like stainless steel, Cast iron, Copper, and Aluminium. Advanced soldering and brazing processes-different types. Welding of plastics- different methods.
Module-3
Welding design: Basic principles of sound welding design, welding joint design, welding positions, Allowable strength of welds under steady loads, allowable fatigue strength of welds, Design of welds subjected to combined stresses, Numerical examples.
Module-4
Welding Symbols: Need for representing the welds, Basic weld symbols, location of weld, supplementary symbols,dimensions of weld, examples. **Adhesive Bonding:** Adhesive materials and properties, non-structural and special adhesives, surface preparation and joint design considerations.
Module-5
Welding of Aluminium and Its Alloys: Introduction, Welding characteristics of Al and its alloys, Weldabilityof Al and its alloys, Processes used for welding Al and its alloys, Oxy-gas, Metallic arc, MIG TIG, Resistance, Solid state, Carbon arc and Atomic hydrogen welding, Brazing of aluminium alloys, welding of aluminium casting.
Course outcome (Course Skill Set) At the end of the course, the student will be able to : 1. Explain the importance of grain size control, methods to avoid distortion and residual stresses; also know the techniques of surfacing and cladding of surfaces. 2. Understand the advantages and limitations of different advanced welding process 3. Explain the weld ability of engineering materials including plastics and the advanced soldering and brazingprocesses. 4. Design welds subjected to for various loading conditions. 5. The symbols used to represent the welds also be able to learned the methods of adhesive bonding of materials. 6. Inspect the welds in accordance with ASTM standards employing both destructive and non-destructive Methods.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Welding Technology O.P. KhannaDhanpatRai Publication 2008
2. Welding and welding Technology Richard Little Tata McGraw hill 2005
3. Welding Engineering Handbook A.W.S. Ninth Edition
4. Advanced Welding processes G. Nikolaev and N. Olshansky MIR Publications 1977 ASM handbook on welding, brazing and soldering Vol 6, 2005.

Web links and Video Lectures (e-Resources):

- https://monroeengineering.com/blog/joining-vs-forming-manufacturing-processes-whats-the-difference/
- https://www.cruxweld.com/blog/types-of-welding-processes/
- https://doi.org/10.31399/asm.hb.v06.a0001442
- https://www.hardfacingfty.com/cladding-welding/
- https://www.twi-global.com/technical-knowledge/faqs/faq-how-can-i-assess-the-weldability-of-a-material
- https://www.slideserve.com/gavan/weldability
- https://www.nrc.gov/docs/ML1215/ML12157A631.pdf
- https://weldguru.com/welding-symbols/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Contents related activities (Activity-based discussions)
2. For active participation of students to learn about demonstration in lab
3. Instruct the students individual to prepare for module wise ppt
4. Suggest them to Group wise discussions and weldability based activities Quizzes on various types of Joining process and Discussions

JIT Manufacturing		Semester	III
Course Code	**BIP306B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- Eliminate waste that is, minimise the amount of equipment, materials, parts, space, and worker's time, which adds a great value to the product
- Increase productivity.
- To produce and deliver what is needed, when it is needed, at all stages of the production process.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Videos/animation films to explain the content, wherever possible.
3. Encourage collaborative Learning (Group Learning) in the class.
4. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Discuss how every concept can be applied to the real world thus helping to improve the student's understanding.
6. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

INTRODUCTION: Speed of JIT movement, the new production system research association of Japan, some definitions of JIT, core Japanese practices of JIT, enabling JIT to occur, basic element of JIT, benefits of JIT. **MODERN PRODUCTION SYSTEM**: Key feature of Toyota's production system, basic framework of Toyota production system.

KANBAN SYSTEM other types of kanban's, kanban rules, determining the number of kanban's in Toyota production system.

Module-2

PRODUCTION SMOOTHING IN TOYOTA PRODUCTION SYSTEM: production planning, production smoothing, adaptability to demand fluctuations, sequencing method for the mixed model assembly line to realize smoothed production. EDP system for support of the Toyota Production system. **GLOBAL IMPLEMENTATION OF JIT**: JIT in automotive industry, JIT in electronics, computer, telecommunication and instrumentation, JIT in process type industry, JIT in seasonal demand industry, other manufacturing industries, conclusion.

Module-3

JIT IMPLEMENTATION SURVEYS: JIT implementation in US manufacturing firms-analysis of survey results, just in time manufacturing industries, just in time production in West Germany, just in time production in Hong Kong electronics indu8stry, conclusion. DESIGN, DEVELOPMENT AND MANAGEMENT OF JIT MANUFACTURING SYSTEMS: plant configurations and flow analysis for JIT manufacturing, comparison of JIT's "demand pull" system with conventional "push type" planning and control systems, quality management system for JIT, productdesign for JIT human resource management in JIT, flexible workforce system at Toyota.

Module-4

SUPPLY MANAGEMENT FOR JIT: JIT purchasing-the Japanese way, some studies in JIT purchasing, experience of implementation organizations, surveys of JIT purchasing, buyer-seller relationship in JIT purchasing, Quality certification of suppliers in JIT purchasing, some problems in implementation of JIT purchasing, reduction freight costs in JIT purchasing, monitoring supplier performance for JIT purchasing, audit in JIT purchasing, implementation of JIT to international sourcing.

Module-5

FRAMEWORK FOR IMPLEMENTATION OF JIT: Implementation risk, risks Due to inappropriate understanding of JIT, risks due to technical, operational and people problems, risks associated with kanban system, some important activities to be performed during implementation, steps in implementation, a project work to approach to implementation, conclusion.

Course outcome (Course Skill Set)

1. At the end of the course, the student will be able to :
2. Produce an overview on lean / just-in-time and repetitive manufacturing.
3. Explain the lean / just-in-time concept in detail.
4. Describe the Kanban technique.
5. Identify the cumulative production figures principle.
6. Disclose an implementing procedure and a comparison of techniques.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Just In Time Manufacturing M.G. Korgaonker Macmillan India Ltd., 1992.
2. Japanese Manufacturing Techniques Richard J. SchonbergerThe Free Press – Macmillan Pub. Co., Inc. New York, 1988.

Web links and Video Lectures (e-Resources):

- www.nptel.com
- https://youtu.be/zCTmN17ZDek
- https://youtu.be/cAUXHJBB5CM
- https://youtu.be/6y3qrOla9Tc
- https://youtu.be/OXVi7dOF3jU
- https://youtu.be/9onMrDbDKaM
- https://study.com/academy/lesson/jit-lean-implementation-uses-drawbacks.html
- https://www.investopedia.com/terms/j/jit.asp
- https://youtu.be/9OL7BMBa4ys

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, assignments are to be given under each of the topics covered.

Facility Planning and Design		Semester	III
Course Code	**BIP306C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- To know the importance of location, layouts and material handling
- To know and distinguish between different approaches to layout and draw activity relationship chart
- To compute space requirement and demonstrate skills in area allocation and construct the layout.
- To examine the quantitative approaches to facility planning and identify the different models.
- To know the different computerized techniques and model appropriate design.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Industrial and Production Engineering structures.
3. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
4. Encourage collaborative (Group Learning) Learning in the class.
5. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
6. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Plant Location: Factors influencing plant location, theories of plant location, plant layout objectives of plant layout, principles of plant layout, types of plant layout, their merits and demerits, facilities design function: objectives. Simple exercises on layouts.

Introduction to Material Handling: Objectives and principles of material handling, unit load concept, Basic handling equipment types, Common material handling equipments

Module-2

Plant Design: Layout procedure, study of some approaches (Immer, Nadler, Muther, Apple James and Reed's approach), systematic layout planning, the activity relationship chart, Constructing the activity relationship chart, Activity relationship diagram.

Module-3

Space Determination and Area Allocation: Factors for consideration in space planning, receiving, storage, production, shipping, tool room and tool crib, other auxiliary service actions, establishing total space requirement, area allocation factors to be considered, expansion, flexibility, aisles column, area allocation procedure, the plot plan.

Construction of the Layout: Methods of constructing the layout, evaluation of layout, efficiency indices, presenting layout to management.

Module-4

Quantitative approaches to facilities planning: Deterministic models, single and multi facility models, Conventional layout model: Block stacking, location allocation models.

Layout Models: Warehouse layout models, waiting line models, Storage models.

Module-5

Computerized Layout Planning: Computerized relative allocation of facility techniques (CRAFT), Plant layout Evaluation Techniques (PLANET), Computerized Relationship Layout Planning (CORELAP), Comparison of computerized layout techniques.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

- Identify the planning strategies for implementation, evaluation and maintaining the facility.
- Arrive at suitable layout for given situations having understand different approaches.
- Demonstrate the Space determination and area allocation procedure, construction of the layout.
- Analyze the quantitative methods and models to determine for the plant location. Explain the
- Warehouse and waiting line models.
- Demonstrates the ideas on various types of layout and evaluation techniques using computers.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Plant layout and material handling, James M. Apple John, Wiley and sons 3 edition, 1991.
2. Facility layout and location Françoise, R.L.and White, J.A, McGraw Hill 2nd edition, 1994.
3. Practical layout, Muther Richard, McGraw Hill, 1956
4. Plant layout design, James.M Moore, Mac Millon 1962
5. Facilities design, SundereshHerag, u PWS publishingcompany, ISBN-0-534-95183,August 2008
6. Facilities planning, Tompkins white, wiley India Pvt ltd 3rd edition.
7. Facility Layout and Location, Richard L Francies PHI learning Pvt. Ltd 2nd Edition

Web links and Video Lectures (e-Resources):

- https://www.coursehero.com/file/10902415/Plant-Location/
- http://arts.brainkart.com/article/plant-location---introduction-to-operations-management-1098/
- https://www.businessmanagementideas.com/project-management/plant-location/plant-location-importance-techniques-and-procedure/6658
- https://www.wisdomjobs.com/e-university/production-and-operations-management-tutorial-295/introduction-and-meaning-9445.html
- https://books.google.com/books/about/Introduction_to_Materials_Handling.html?id=SwFaOAAACAAJ
- https://www.vskills.in/certification/tutorial/space-determination-and-area-allocation-2/
- https://www.youtube.com/watch?v=-aGk5-yx340
- https://www.youtube.com/watch?v=3OtGymbhbwo

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Contents related activities (Activity-based discussions)
2. For active participation of students, instruct the students to prepare Exercise problems
3. Organizing Group wise discussions and machineries issues based activities
4. Quizzes and Discussions
5. Seminars and assignments

Productivity Engineering		Semester	**III**
Course Code	**BIP306D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- To know the importance of productivity concepts.
- To know the productivity evaluation models.
- To compute the Re engineering process improvement models
- To examine the Re engineering tools

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Industrial and Production Engineering structures.
3. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
4. Encourage collaborative (Group Learning) Learning in the class.
5. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
6. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Introduction. Productivity concepts – Macro and Micro factors of productivity, productivity benefit model, productivity cycle.

Module-2

Productivity models: productivity measurement at international, National and organisational level, Total productivity models, productivity management in manufacturing and service sector. Productivity evaluation models.

Module-3

Organisational Transformation: Principles of organisational transformation and re-engineering, fundamentals of process engineering, preparing the workforce for transformation and re-engineering, methodology, guidelines.

Module-4

Re-engineering Process Improvement Models: PMI models, Edosomwan model, Moen and Nolan strategy for process improvement, LMICIP model, NPRDC model.

Module-5

Re-engineering Tools and Implementation: Analytical and process tools and techniques – Information and communication technology – Enabling role of IT, RE-opportunities, Process redesign cases.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

- Identify the productivity concepts, benefit model.
- Analyze the Re-engineering Tools and Implementation
- Re-engineering Process Improvement Models

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Sumanth D J "Productivity engineering and management" THM new delhi 1990.
2. Edosomwan J A "Organisational transformation and process re engineering" British library cataloging in pub data 1996.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, assignments are to be given under each of the topics covered.

Social Connect and Responsibility		Semester	III
Course Code	**BSCK307**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	30	Total Marks	100
Credits	01	Exam Hours	01
Examination type (SEE)	**Theory**		

Ability Enhancement Course / Skill Enhancement Course – III

An Overview of Emerging Technologies		Semester	III
Course Code	**BIP358A**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	01
Examination type (SEE)	**Theory**		

Course objectives:

- To understand the emerging technologies in the context of Industrial and Production Engineering.
- To study data science as a tool for decision making in Engineering.
- To understand the concept of AI, IOT and other Emerging Technologies.
- To study the role of ethics in modern Technology driven era.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Encourage collaborative Learning (Group Learning) in the class.
3. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
4. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Introduction to Emerging Technologies:

Evolution of technologies, Introduction to Industrial revolution, Historical background of the Industrial Revolution, Human to Machine Interaction, Future trends in emerging technologies.

Module-2

Data Science:

Overview for Data Science, Definition of data and information, Data types and representation, Data Value Chain, Data Acquisition, Data Analysis, Data Curating, Data Storage.

Module-3

Artificial Intelligence (AI):

Concept of AI, meaning of AI, History of AI, Levels of AI, Types of AI.

Module-4

Internet of Things (IoT):

Overview of IOT, meaning of IOT, History of IOT, Architecture of IOT, Advantages of IOT, Applications of IOT at Manufacturing, Agriculture, Smart home, Smart city.

Module-5

Ethics, Professionalism and Other Emerging Technologies: Technology and ethics, General ethical principles, Digital privacy.

Other Technologies: Block chain technology, Cloud and quantum computing, Cyber security, Additive manufacturing (3D Printing)

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

1. Identify different emerging technologies
2. Select appropriate technology and tools for a given task
3. Identify necessary inputs for application of emerging technologies
4. Understand the latest developments in the area of technology.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. Emerging exponential technologies, Dr. Deepak G Kulkarni and Dr. Prayag P Gokhale. Himalaya Publishing House.
2. Introduction to Emerging Technologies Course Module, Tesfahunegn Minwuyelet (MSC) & Makonnen Wagaw (Ph.D.) CH-1, 4 & 5 from BDU, Girma Debela (MSc) CH-2 from ASTU.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=Keq0gNtXuss
- https://www.britannica.com/event/Industrial-Revolution
- https://www.simplilearn.com/top-technology-trends-and-jobs-article
- https://www.heavy.ai/learn/data-science
- https://engineering.purdue.edu/ME/Research/HumanMachine
- https://study.com/academy/lesson/types-of-data-text-numbers-multimedia.html
- https://www.simplilearn.com/data-analysis-methods-process-types-article
- https://builtin.com/artificial-intelligence
- https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT
- https://archive.ethicsandtechnology.eu/wp-content/uploads/downloadable-content/Brey-2017-Ethics-Emerging-Tech.pdf

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Basics of Industrial Safety		Semester	III
Course Code	**BIP358B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	01
Examination type (SEE)	Theory		

Course objectives:

- To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models
- To understand about fire and explosion, preventive methods, relief and its sizing methods
- To analyse industrial hazards and its risk assessment

Teaching-Learning Process (General Instructions)
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
- Encourage collaborative Learning (Group Learning) in the class.
- Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
- Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Introduction:
Elements of safety programming: awareness of Risk, why do accidents occur, how effective is the Legislation.

Module-2

Safety Management:
Introduction , Organisation and Personnel, planning, Safety Management System, Management representation Competence Mapping , Communication, Design, emergency preparedness, System Audits, Review, Safety Committees, Corrective Preventive action, Right of employees, Personal protective equipment Restrictions on contract work.

Module-3

Upgrading developmental programs:
Safety procedures, Arrangements and performance measures. Education, Training and development safety.

Module-4

Safety performance Planning:
An overview of an accident, Safety professional occupational health and industrial hygiene.

Module-5

Investigation and preventation:
Reasons, Results, Repair The 'Permit – to – work' systems. Trips, slips and falls Safe handling and storage – materials handling.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

1. Analyze the effect of release of toxic substances
2. Understand the industrial laws, regulations and source models.
3. Apply the methods of prevention of fire and explosions.
4. Understand the relief and its sizing methods.
5. Understand the methods of hazard identification and preventive measures

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. Industrial Safety Management, L M Deshmukh.
2. Fundamentals of Industrial Safety and Health, Dr. K U istry, Gujjar Graphics and Printers, 2008.
3. Industrial Safety Management, 21st Century Perspectives of Asia, Springer,2018.

Web links and Video Lectures (e-Resources):

- https://connecteam.com/workplace-safety-training-need/
- https://iosh.com/employees/awareness-courses/working-safely/
- https://connecteam.com/workplace-safety-tips-manufacturing/
- https://www.aiche.org/academy/courses/ch910/foundations-process-safety
- https://www.safetyandhealthmagazine.com/articles/14054-common-workplace-safety-hazards

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

•At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Introduction to Risk Management		Semester	III
Course Code	**BIP358C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	01
Examination type (SEE)	Theory		

Course objectives:

- Demonstrate knowledge of the range of financial and financial related risks facing organisations.
- Understand the credit risk
- Understand operational risk and how to manage it.
- Understand market risk

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teachingmethod may be adopted to develop the outcomes.
2. Show Videos/animation films to explain the content, wherever possible.
3. Encourage collaborative Learning (Group Learning) in the class.
4. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Discuss how every concept can be applied to the real world thus helping to improve the studentsunderstanding.
6. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

AN OVERVIEW

Risk definition/policies, Risk process- Risk Organization, Key risks-Credit risk, market risk, operational risk, liquidity risk, legal risk, interest rate risk and currency risk.

Asset Liability Management, ALM Concept, ALM organization, ALCO techniques/tools, Simulation, Gap, Duration analysis, Linear and other statistical methods of control.

Module-2

Risk management, Capital adequacy norms, Prudential norms, Exposure norms, Concept of Mid office, Forwards, Futures, Options, Strategies and Arbitrage opportunities, Regulatory prescriptions of risk management.

Module-3

CREDIT RISK MANAGEMENT

Credit risk-standardized approach, Credit risk-advanced approach, Credit rating/credit scoring and rating system design, Credit Bureaus, Stress test and sensitivity analysis, Internal Capital Adequacy Assessment Process (ICAAP), Introduction to structured products.

Module-4
OPERATIONAL RISK MANAGEMENT Introduction, Basel-I & II, RBI guidelines, Likely forms of operational risk and causes for significant increase in operational risk, Sound Principles of Operational Risk Management (SPOR), SPOR- organizational set up and key responsibilities of ORM, SPOR- policy requirements and strategic approach for ORM.
Module-5
MARKET RISK Introduction and definition. Prescriptions of Basel- I & II, Liquidity risk. Interest rate risk, foreign exchange risk, Price risk (Equity), Commodity risk, Treatment of market risk under Basel.
Course outcome (Course Skill Set) At the end of the course the student will be able to: • Explain various types of risks • Summarize the principal types of financial risk – market risk and capital adequacy, credit risk, liquidity risk, operational, legal and compliance risks, reputational risk • Examine the notion that risk management should become part of an organisation's culture • Explain the methodological principles of Value at Risk (VaR). Is it is a reliable indicator of portfolio risk – • e.g. are asset returns normally distributed? • Explain how, especially in the aftermath of a financial crisis, there is need for an integrated or holistic • approach to risk management – increasing recognition that market risk, credit risk and liquidity risk are all interdependent

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

- Risk management and insurance, Mark S Dorfman, 9th edition, PHI publication
- Risk management, Indian institution of banking and finance, MACMILLAN publications, CAIIB
- Risk management and derivatives, Rene M Stulz,
- Principles of Risk management and insurance, George E rejda, Michael Mcnamara,13th edition, pearson.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=IP-E75FGFkU
- https://www.youtube.com/watch?v=ZKDB64uYIIo
- https://www.youtube.com/watch?v=1LgJVxvE8AY
- https://www.youtube.com/watch?v=qAP1gccYbfs
- https://www.youtube.com/watch?v=kaB-RUnrhlU
- https://www.youtube.com/watch?v=s2ogL-1wdaE
- https://www.youtube.com/watch?v=U4Kh7Ig0R8M
- https://www.youtube.com/watch?v=Fcw1-Olmi_s

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, Group discussions are to be given for practice and also as assignments under each of the topics covered.

Spreadsheet for Engineers (Laboratory)		Semester	**III**
Course Code	**BIPL358D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	01
Examination type (SEE)	**Practical**		

Course objectives:

- To create different plots and charts
- To compute different functions, conditional functions and make regression analysis
- To carryout iterative solutions for roots, multiple roots, optimization and non-linear regression analysis
- To carryout matrix operations
- To Understand VBA and UDF
- To understand VBA subroutines and Macros
- To carryout numerical integration and solving differential equations using different methods

Sl.NO	**Experiments**
1	**Charting:** Create an XY scatter graph, XY chart with two Y-Axes, add error bars to your plot, create a combination chart
2	**Functions:** Computing Sum, Average, Count, Max and Min, Computing Weighted Average, Trigonometric Functions, Exponential Functions, Using The CONVERT Function to Convert Units
3	**Conditional Functions:** Logical Expressions, Boolean Functions, IF Function, Creating a Quadratic Equation Solver, Table VLOOKUP Function, AND, OR and XOR functions.
4	**Regression Analysis:** Trendline, Slope and Intercept, Interpolation and Forecast, The LINEST Function, Multilinear Regression.
5	**Iterative Solutions Using Excel:** Using Goal Seek in Excel, Using The Solver To Find Roots, Finding Multiple Roots, Optimization Using The Solver.
6	**Matrix Operations Using Excel:** Adding Two Matrices, Multiplying a Matrix by a Scalar, Multiplying Two Matrices.
7	**VBA User-Defined Functions (UDF):** The Visual Basic Editor (VBE), The IF Structure, The Select Case Structure, The For Next Structure.
8	**VBA Subroutines or Macros:** Recording a Macro, Coding a Macro Finding Roots by Bisection, Using Arrays, Adding a Control and Creating User Forms.
	Demonstration Experiments (For CIE)
9	**Numerical Integration Using Excel:** The Rectangle Rule, The Trapezoid Rule, The Simpson's Rule, Creating a User-Defined Function Using the Simpson's Rule.
10	
11	**Differential Equations:** Euler's Method, Modified Euler's Method, The Runge Kutta Method, Solving a SecondOrder Differential Equation
12	

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

- To create different plots and charts
- To compute different functions, conditional functions and make regression analysis
- To carryout iterative solutions for roots, multiple roots, optimization and non-linear regression analysis
- To carryout matrix operations
- To Understand VBA and UDF
- To understand VBA subroutines and Macros
- To carryout numerical integration and solving differential equations using different methods

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are**50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted

jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- Mc Fedries Paul Microsoft Excel 2019 Formulas And Functions Microsoft Press, U.S, 2019 Edition

National Service Scheme (NSS)		Semester	**III**
Course Code	**BNSK359**	CIE Marks	100
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	0
Total Hours of Pedagogy	30	Total Marks	100
Credits	00	Exam Hours	--
Examination type (SEE)	**Practical**		

Physical Education (PE)		Semester	**III**
Course Code	**BPEK359**	CIE Marks	100
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	0
Total Hours of Pedagogy	30	Total Marks	100
Credits	00	Exam Hours	--
Examination type (SEE)	**Practical**		

Yoga		Semester	**III**
Course Code	**BYOK359**	CIE Marks	100
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	0
Total Hours of Pedagogy	30	Total Marks	100
Credits	00	Exam Hours	--
Examination type (SEE)	**Practical**		

IV SEMESTER

Mechanics of Materials		Semester	IV
Course Code	**BIP401**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- Explain the basic concepts of stress, strain, behaviour of engineering materials under different loading conditions.
- Calculate principal stresses using analytical and graphical methods, shear force and bending moments, deflection and slope of beams, critical loads for different type of columns using Euler's equation
- Plot shear force and bending moment diagrams for beams carrying different types of loads, and various support conditions

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Videos/animation films to explain the content, wherever possible.
3. Encourage collaborative Learning (Group Learning) in the class.
4. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Show the different ways to solve the same problem and encourage the students to adopt creative ways to solve them.
7. Discuss how every concept can be applied to the real world thus helping to improve the students' understanding.
8. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Simple Stress and Strain:

Introduction, Stress and types, Strain, Tensile test on a mild steel bar, Hooke's Law and Poisson's ratio, Stress-Strain relation for cast iron and non-ferrous materials, Extension / Shortening of bars — uniform cross section, with cross sections varying in steps, with continuously varying cross sections (circular and rectangular), Principle of superposition, Elongation due to self weight. Volumetric strain, expressions for volumetric strain for bars with uniform circular and rectangular cross sections, Simple shear stress and shear strain, Elastic constants

(No derivation for relationship between elastic constants).

Module-2

Principal stresses: Stresses in a tensile member, Stresses due to pure or simple shearing, mutually perpendicular direct stresses, Principal planes and stresses, Two-dimensional stress system.

Thick and Thin Cylinder :(Problems are not included) Stresses in thin cylinders, change in dimensions of cylinder (diameter, length and volume). Thick cylinders -Lame's equations for radial and hoop stresses (compoundcylinders and spherical shells not included).

Torsion of Circular Shafts: Introduction, Torsion equation — assumptions and derivation, Torsional rigidity / Stiffness of shafts. Power transmitted by solid and hollow circular shafts, Simple numerical problems.

Columns: Introduction, End conditions, Assumptions in deriving Euler's equations.

Module-3

Bending Moment and Shear Force in Beams:

Introduction - types of beams, loads and reactions, Shear force and bending moment, Sign conventions, Relationship between load intensity, shear force and bending moment; Shear force and Bending moment diagrams for different beams subjected to concentrated loads, uniformly distributed load, (UDL) uniformly varying load (UVL) and couple.

Module-4

Bending Stresses in Beams:

Moment of inertia and section modulus for different sections (I, T, rectangular, and circular —only formulae). Introduction to theory of simple bending, assumptions in simple bending theory, Bending stress equation – relationship between bending stress and radius of curvature, relationship between bending moment and radius of curvature; Moment carrying capacity of a section. Simple problems on rectangular, symmetrical I (about NA) and T sections. (composite / notched beams not included).

Module-5

Deflection of Beams:

Introduction, Differential equation for deflection (flexure), Sign conventions and assumptions, Equations for deflection and slope - Double integration method for cantilever and simply supported beams for point load, uniformly distributed load, uniformly varying load, and couple (Macaulay's method not included).

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

1. Provide the basic concepts and principles of mechanics of materials.
2. Calculate stresses and deformations of objects under external loadings.
3. Apply the knowledge of mechanics of materials applications and design problems.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Strength of Materials by R K Rajput, S. Chand and Company Pvt, 2014.
2. Fundamentals of Strength of Materials by P N Chandramouli, PHI Learning Pvt. Ltd, 2013.
3. Mechanics of Materials by R C Hibbeler, Pearson, Latest edition
4. Mechanics of Materials by James M Gere, Thomson Learning, Latest edition
5. Mechanics of Materials by Ferdinand Beer, Russell Johston and others, McGraw Hill Education (India) Pvt.Ltd, Latest edition

Web links and Video Lectures (e-Resources):

- www.nptel.ac.in
- https://www.youtube.com/watch?v=aQf6Q8t1FQE&vl=en
- https://youtu.be/1YTKedLQOa0
- https://youtu.be/C-FEVzI8oe8
- https://youtu.be/Bls5KnQOWkY
- https://www.youtube.com/watch?v=MvBqCeZllpQ

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Axial deformation activity
- Simple or direct shear stress activity
- Torsional shear stress and design activity
- A couple additional possible activity
- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Mechanical Measurements and Metrology		Semester	**IV**
Course Code	**BIP402**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	**Theory**		

Course objectives:

- Explain significance of mechanical measurements, elements of a generalized measuring system
- Theory and working principle of measuring instruments for the measurement of force, torque, flow, temperature, pressure and strain
- Define Metrology, appreciate the objectives of Metrology, and explain the importance of standards.
- Interpret the limits specified, identify fits and explain the concept of tolerance
- Use comparators, screw and gear metrology

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Videos/animation films to explain the content, wherever possible.
3. Encourage collaborativeLearning (Group Learning) in the class.
4. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Show the different ways to solve the same problem and encourage the students to adopt creative ways to solve them.
7. Discuss how every concept can be applied to the real world thus helping to improve the student's understanding.
8. Individual teachers can device innovative pedagogy to improve teaching-learning.

MODULE-1

Standards of measurement: Definition and Objectives of metrology, Standards of length International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and end standard, Slip gauges, Wringing phenomenon of slip gauges, Indian Standard on slip gauge. (Numerical problems on building of slip gauges are excluded).

System of Limits, Fits, Tolerance: Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly, limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS919-1963), geometrical tolerance, positional-tolerances, System of fits, hole basis system, shaft basis system. Numerical problems on limits, fits and tolerances.

MODULE-2

Gauges: classification of gauges, brief concept of design of gauges, Taylor's principles in the design of guages, Method of gauge maker's tolerance, Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials. Numerical problems on the design of gauges.

Comparators: Introduction to comparators, characteristics, classification of comparators, mechanical comparators-Johnson Mikrokator, sigma comparators, dial indicator, optical comparators-principles of optical level, Zeiss ultra optimeter, electric and electronic comparators- eletrolimitguage, LVDT, pneumatic comparators-flow type and back pressure type, solex pneumatic comparators.

MODULE-3

Angular measurements: Verniarbevel protractor,optical bevel protractor, sine bar, principle of sine bar and use of sine bars, sine centre, use of angle gauges. Clinometer.

Optical measurements: Principle of interferemetry, interference patterns, principle of optical flat, Optical flats, principle of autocollimator, Tool maker's microscope.

Screw thread and gear measurement: Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2-wire and 3-wire methods, best size wire, gear tooth terminology, use of gear tooth verniercaliper and micrometer.

MODULE-4

Measurements and measurement systems: Definition, significance of measurement, generalized measuring system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysterisis, repeatability, linearity, loading effect, system response-times delay. Errors in measurement, classification of errors. Transducers, transfer efficiency, primary and secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers.

Intermediate modifying and terminating devices: Mechanical systems, inherent problems, electrical intermediate modifying devices, input circuitry, ballast circuit, electronic amplifiers and telemetry. Terminating devices, mechanical, cathode ray oscilloscope, oscillographs, X-Y plotters

MODULE-5

Measurement of force, torque and pressure: Principle, analytical balance, Unequal arm balance, platform balance, proving ring. Torque measurement, Prony brake, hydraulic dynamometer, electric dynamometer Eddy-current and DC dynamometer. Pressure measurements, types of pressure measuring devices, Bridgeman gauge, Mcloed gauge, Pirani gauge, thermocouple vacuum gauge.

Temperature and strain measurement: Resistance thermometers, thermo electric effects-Seebeck effect, peltier effect, Thompson effect, thermocouple, law of thermo couple, materials used for construction of thermocouples, pyrometer-total radiation pyrometer and optical pyrometer. Strain measurements, strain gauge, types strain gauges-mechanical strain gauge, optical strain gauge and electrical strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Calibration of Micrometer using slip gauges
2	Calibration of Thermocouple and Pressure Gauge
3	Calibration of LVDT and Calibration of Load cell
4	Measurement of angle using Sine Centre / Sine bar / bevel protractor
5	Measurements using Optical Projector / Toolmaker Microscope
6	Measurement of alignment using Autocollimator
7	Measurement of Screw threads Parameters using Two wire or Three-wire method
8	Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer
	Demonstration Only
9	Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
10	Measurement of cutting tool forces using a. Lathe tool Dynamometer b. Drill tool Dynamometer.
11	Determination of modulus of elasticity of a mild steel specimen using Strain gauges.
12	Measurement using Optical Flats

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

- Explain significance of mechanical measurements, elements of a generalized measuring system
- Theory and working principle of measuring instruments for the measurement of force, torque, flow, temperature, pressure and strain
- Define Metrology, appreciate the objectives of Metrology, and explain the importance of standards.
- Interpret the limits specified, identify fits and explain the concept of tolerance
- Explain the use of comparators, screw and gear terminology

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other

assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Mechanical Measurements, Beckwith Marangoni, Pearson Education, 6th Ed., 2006.
2. Engineering Metrology, R.K. Jain, Khanna Publishers, 1994
3. Engineering Metrology, I.C. Gupta, DhapatRai Publications Mechanical Measurements, R.K. Jain, Khanna Publishers

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=7ZteZ5UTW6E
- https://www.youtube.com/watch?v=U8y48L_qn6E
- https://www.youtube.com/watch?v=3pNqYFCMdpA
- https://www.youtube.com/watch?v=4fPW-SMABwY
- https://www.youtube.com/watch?v=eQB63tMz8SI
- https://www.youtube.com/watch?v=saoOUXYXde0
- https://www.youtube.com/watch?v=A3sPqnczDLQ
- https://www.youtube.com/watch?v=a2zzBnyxv1E
- https://www.youtube.com/watch?v=7ZteZ5UTW6E
- https://www.youtube.com/watch?v=5wqaGZICdTI
- https://www.youtube.com/watch?v=BxVzeeMy00c

- https://www.youtube.com/watch?v=Ctw0NlKATWU
- https://www.youtube.com/watch?v=M0UYpipTAWM

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Production Engineering - II		Semester	**IV**
Course Code	**BIP403**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	**Theory**		

Course objectives:

- Explain the nomenclature of single point cutting tool, mechanics of chip formation, tool failure criteria and to solve problems on evaluation of tool life
- Construction and working of various systems in a Lathe, Shaper, Planing and Drilling machine Classify grinding and milling machines and explain their construction
- Explain the principles of broaching
- Select non-traditional machining process for given application

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Videos/animation films to explain the content, wherever possible.
3. Encourage collaborative Learning (Group Learning) in the class.
4. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking. Discuss how every concept can be applied to the real world thus helping to improve the students understanding.
5. Individual teachers can device innovative pedagogy to improve teaching-learning.

MODULE-1

Classification of metal removal process and machines: Concept of orthogonal and oblique cutting Geometry of single point cutting tool and tool angles, tool nomenclature. Mechanism of Chip Formation: Type of chips. Mechanics of metal cutting, Merchants circle diagram and analysis, Ernst Merchant's solution, shear angle relationship, Tool Wear and Tool failure, tool life. Effects of cutting parameters on tool life. Tool Failure Criteria, Taylor's Tool Life equation.

MODULE-2

Desired properties and types of cutting tool materials – HSS, carbides coated carbides, ceramics. Cutting fluids. Desired properties, types and selection. Heat generation in metal cutting, factors affecting heat generation. Heat distribution in tool and work piece and chip.

Turning (Lathe), Shaping Machines: Classification, constructional features of Turret and Capstan Lathe. Tool Layout, shaping Machine, Different operations on lathe.

MODULE-3

Drilling machines: drilling & related operations, Classification of drilling machine, constructional features and working principle of Radial, multi spindle, Gang, Deep hole and automatic drilling machine, Types of drill & drill bit nomenclature.

Milling machines: Classification, constructional features, milling cutters nomenclature, milling operations, up milling and down milling concepts. Various milling operations.

Indexing: Simple, compound, differential and angular indexing calculations. Simple problems on simple and compound indexing.
MODULE-4
Grinding machines: Types of abrasives, Grain size, bonding process, grade and structure of grinding wheels, grinding wheel types. Classification, constructional features of grinding machines (Center less, cylindrical and surface grinding). **Broaching process** - Principle of broaching. Details of a broach. Types of broaching machines constructional details. Applications, Advantages and Limitations.
MODULE-5
Finishing and other Processes: Lapping and Honing operations Principles, arrangement of set up and application. Super finishing process, polishing, buffing operation and application. **Non-traditional machining processes:** Need for non-traditional machining, Principle, equipment & operation of Laser Beam, Plasma Arc Machining, Electro Chemical Machining, Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining, Electron Beam Machining, Electron Discharge Machining and Plasma Arc Machining.

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Preparation of 2 to 3 models involving the following operation plain turning, taper turning , step turning, facing, thread cutting, knurling, drilling, boring, internal thread cutting, Eccentric turning.
2	Measurement of cutting forces, determination of shear angle, chip thickness ratio and verification of Merchant's angle relationship in turning operation.
3	Study of different types chips formed by different materials (atleast one ductile and one brittle material) with different parameters like cutting speed, feed.
4	Simple problems on simple and compound indexing.
Demonstration only	
5	Models involving the milling operations such as production of flat and taper surfaces.
6	Models using surface grinding demonstration of cylindrical grinding cutter and tool grinder
7	Assembly and disassembly of lathe parts (Tailstock and headstock).
8	Conducting acceptance test in lathe, milling machine.
9	Cutting of gear teeth using milling machine.
10	Models involving the shaping operations such as production of flat surfaces, V & rectangular grooves, cutting dovetails.

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

- Explain the nomenclature of single point cutting tool, mechanics of chip formation, tool failure criteria and to solve problems on evaluation of tool life.
- Apply the knowledge of various manufacturing processes.
- Design and analyze various manufacturing processes and tooling.
- Construction and working of various systems in a Lathe, Shaper, Planing and Drilling machine.
- Classify grinding and milling machines and explain their construction.
- Explain the principles of broaching.
- Select non-traditional machining process for given application.
- Figure out application of modernization in machining.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

5. The question paper will have ten questions. Each question is set for 20 marks.
6. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
7. The students have to answer 5 full questions, selecting one full question from each module.
8. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Workshop Technology by Hazara Choudhry, Media Promoters & Publishers Pvt. Ltd., Vol-II, 2004. Production Technology by R. K. Jain, Khanna Publications, 2003.
2. Manufacturing Science by Amitabh Ghosh, East West Press, 2003.
3. Fundamentals of Metal Machining and Machine by G. Boothroyd, McGraw-Hill, 2000.
4. Production Technology by HMT,Tata McGraw-Hill, 2001.

Web links and Video Lectures (e-Resources):

www.nptel.ac.in

- https://youtu.be/6cxazvaS6SA
- https://youtu.be/bUrp8JMRwx4
- https://youtu.be/nUQ9rvNES7U
  https://youtu.be/GghdbT0CyvI?list=PLVxUmFzqKAUHf1pg7NhMzD58pQVnhR8XA
- https://youtu.be/h2pKPpLWwr8?list=PLVxUmFzqKAUHf1pg7NhMzD58pQVnhR8XA
- https://youtu.be/2fDJ1Wk-y04?list=PLVxUmFzqKAUHf1pg7NhMzD58pQVnhR8XA
- https://youtu.be/YCLZMx_nhsM
- https://youtu.be/W-V7zfOVNkE
- https://youtu.be/ar-cG8tHVRQ
- https://youtu.be/hheFVuUBpxo
- https://youtu.be/K39bnxmIz7Q
- https://youtu.be/GHukUKMLDMY

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

CAD and CAE Lab		Semester	IV
Course Code	**BIPL404**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	03
Examination type (SEE)	**Practical**		

Course objectives:

- To Study the fundamentals of CAD.
- To develop a sound knowledge of Assembly of components.
- To have basic skills to analysis the structural components

Sl.NO	Experiments
1	Assembly drawing of following machine parts (3D parts to be created and assembled and then getting 2D drawing with required views, along with 3D part drawings). I. Screw jack (Bottle type) II. Machine vice
2	Modelling of simple machine parts using Graphics Package
3	Study of Finite Element Analysis Package - 1D, 2D, Structural problems
4	Evaluation of displacement (Strain) and Stress.
5	Problems involving on Beams and Trusses

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

- Understand the concepts of component design.
- Understand the various parameters of analysis on components.
- Understand the different models of machine parts.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are**50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted

jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- Machine Drawing K. R. Gopala Krishna Subhash Publication.
- A Primer on Computer Aided Machine Drawing Published by VTU
- A Text Book of Computer Aided Machine Drawing S. Trymbaka Murthy CBS Publishers, New Delhi 2007
- Machine Drawing with Auto CAD Goutam Purohit & GouthamGhosh 1st Indian print Pearson Education, 2005

Engineering Science Course/Emerging Technology Course/ Programming Language Course (ESC/ETC/PLC)

Artificial Intelligence and Manufacturing		Semester	IV
Course Code	**BIP405A**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- To understand the modern manufacturing concepts.
- To learn the concept of AI based methods for process controls.
- To analyse the automated material handling systems.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Videos/animation films to explain the content, wherever possible.
3. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
4. Show the different ways to solve the same problem and encourage the students to adopt creative ways to solve them.
5. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Introduction to Modern Manufacturing and AI Based Applications:

Introduction to Modern Manufacturing Process, Industry 4.0, Introduction to AI and its applications in manufacturing, Design in Manufacturing and AI Requirements.

Module-2

AI based Methods for Process Control & Monitoring:

Machine Learning methods, AI based Monitoring and control of discrete manufacturing process, Online process monitoring in additive manufacturing, Industrial Machine Vision, Development of Digital Twins.

Module-3

AI based Design Space Exploration:

Multi objective heuristic search for DSE, Algorithms for Customizable Manufacturing, Allocation and Layout, Scheduling for flexible manufacturing systems.

Module-4

AI & Robotics:

AI based Robot Architecture & Applications in Automated Manufacturing, Robot Vision & Motion, Multi agent and swarm robotics, Robot to Robot and Robot to human coordination (Cobots - collaborative robotics) Reliable & Trusted AI in Robotics.

Module-5

Automated material Handling Storage: Material functions, types of material handling equipment, analysis of material handling systems, design of system, conveyor system, automated guided vehicle systems, automated storage/retrieval systems, caroused storage systems work in process storage, interfacing handling & storage with manufacturing.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

- Explain the fundamentals of Artificial Intelligence In smart manufacturing.
- Understand the AI based Monitoring and control of discrete manufacturing process.
- Understand the automated material handling and storage concepts.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

- Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig, 3rd Edition, Prentice Hall, 2009.
- Deep Learning - Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press, 2018
- Additive manufacturing of Metals: The Technology, Materials , Design and Production; Ed. Li Yang, et al.; Springer International Publishing AG 2017
- Laser Materials Processing, by W M Steen, J. Mazumder, 4th Ed. Springer
- Handbook of Industrial Robotics by Shimon Y. Nof (Editor), ISBN 9788126540303.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=lTsvhSYstAE
- https://www.forbes.com/sites/bernardmarr/2018/09/02/what-is-industry-4-0-heres-a-super-easy- explanation-for-anyone/?sh=162dc3409788
- https://professional.mit.edu/news/articles/4-ways-ai-will-change-design-and-manufacturing
- https://www.hpe.com/in/en/what-is/machine-learning.html?jumpid=ps_u8bvx1ziqh_aid-520061736&ef_id=Cj0KCQjwmuiTBhDoARIsAPiv6L9QsMm4otXbOHvIYNeBMp2VcsEEtY3bvg3k77Xbh_JHpT8f4l48jPMaAiuMEALw_wcB:G:s&s_kwcid=AL!13472!3!558204153004!e!!g!!types%20of%20machine%20learning!14386686693!128518518145&
- https://theconversation.com/five-ways-artificial-intelligence-can-help-space-exploration-153664
- https://aibusiness.com/author.asp?section_id=789&doc_id=773741#:~:text=Robotics%20and%20artificial%20intelligence%20are%20two%20related%20but%20entirely%20different,'
- https://www.systema.com/automated-material-handling-systems#:~:text=Automated%20material%20handling%20systems%20ensure,even%20in%20two%20separate%20buildings.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Advanced Machining Processes		Semester	**IV**
Course Code	**BIP405B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- To learn the fundamental concepts of Non-Traditional Machining and their Mechanical Processes
- To have a good knowledge of Abrasive Jet Machining and its application
- To learn the fundamental principles of Electrochemical Machining Process (ECM)
- To have basic exposure to Chemical Machining (CHM) and Chemical Milling
- To imbibe a the basic principles of Thermal Metal Removal Processes, Plasma Arc Machining (PAM)and Laser Beam Machining (LBM)

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
- Encourage collaborative Learning (Group Learning) in the class.
- Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.

Module-1

Introduction: History, need for non-traditional machining processes, classification, process selection. Mechanical Process: Ultrasonic Machining (USM): Introduction, equipment, tool material and tool size, abrasive slurry, Magnetostriction assembly, tool cone (concentrator), exponential concentrator of circular cross section and rectangular cross sections, effect of parameters, amplitude, frequency, grain diameter, applied static load and slurry, tool and work material.

USM process characteristics: material removal rate, tool wear, accuracy, surface finish, applications, advantages and disadvantages of USM.

Module-2

Abrasive Jet Machining (AJM): Introduction, equipment, variables in AJM: carrier gas, size of abrasive grain, velocity of the abrasive jet, mean no. abrasive particles per unit volume of the carrier gas, work material, stand-off distance (SOD), process characteristics-material removal rate. Nozzle wear, Accuracy and surface finish, Applications, advantages and disadvantages of AJM.

Module-3

Electrochemical Machining Process (ECM): Introduction, elements of ECM process: Cathode tool, anode work piece, source of DC power, electrolyte, chemistry of the process, ECM process characteristics – material removal rate, accuracy, surface finish, tool and insulation materials, tool size, electrolyte flow arrangement, applications, simple problems.

Module-4

Chemical Machining (CHM): Introduction, elements of the process, chemical blanking process: preparation of work piece, preparation of masters, masking with photo resists, etching for blanking, accuracy of chemical blanking.

Chemical Milling (Contour machining):- Process steps-masking, etching, etc. process characteristics of CHM: - material removal rate, accuracy, surface finish, application of CHM.

Module-5

Thermal Metal Removal Processes: Electrical Discharge Machining (EDM) - Introduction, mechanism of metal removal, dielectric fluid, spark generator, EDM tool (electrode), electrode material selection, machining time, flushing: suction flushing, side flushing, pulsed flushing synchronized with electrode movement, EDM process characteristics: metal removal rate, accuracy, surface finish, heat affected zone, machine tool selection, applications, electric discharge grinding, travelling wire EDM.

Plasma Arc Machining (PAM): Principle of generation of plasma, equipment, non-thermal generation of plasma, selection of gas, mechanism of metal removal, PAM parameters, process characteristics.

Laser Beam Machining (LBM): Principle of generation of lasers, equipment and machining procedure, types of lasers, process characteristics, applications.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

- Understand the need for advanced manufacturing process and explain the principle of operation of ultrasonic machining process.
- Explain the characteristic features of Abrasive Jet Machining (AJM)
- Define the process parameters influence the material removal rate with the help of characteristics curves.
- Explain the principle of chemical machining and chemical milling process.
- Summarize the various aspects of Electric discharge machining (EDM).Explain the principle of
- Generation plasma and laser and their application in machining

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

- Modern Machining Process, P C Pandey and H S Shan, Tata McGraw Hill, 2008
- New Technology, Bhattacharaya, Institution of Engineering Publication
- Production Technology, HMT, Tata McGraw Hill
- Modern Machining Methods, Dr. M.Adithan, Khanna Publishers, 2008
- Non-conventional Machining, P K Mishra, Narosa publishing House, New – Delhi.2006

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=tPS6uTWySTs
- https://www.youtube.com/watch?v=1MkWjVjNFhY&list=PLYY-vaDZXAyxyB8EY_-4FYfAXfHeNY0Li
- https://www.youtube.com/watch?v=i-PgeWbDgq4
- https://www.youtube.com/watch?v=Jg6YXvTO5FE&list=PLSGws_74K019wxc495SU84wTQ1u1ACvFR
- https://www.youtube.com/watch?v=jhM01_mwygg

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Composite Materials		Semester	IV
Course Code	**BIP405C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- Foundation for understanding of composite materials.
- Exposure to the fabrication of composites.
- To impart the knowledge of structural applications of composites.
- To learn Micro analysis of unidirectional lamina.
- To learn the study properties of MMC's.
- To impart the knowledge for applications of natural composites

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
- Encourage collaborative Learning (Group Learning) in the class.
- Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.

Module-1

Introduction to composite materials

Definition, classification and characteristics of composite materials: Fibrous, laminate, particulate, flake composites. Properties and types of reinforcement and matrix materials. Fibre reinforced plastic processing: basic steps in manufacturing of a composite, impregnation, lay-up, consolidation and solidification. Open and closed mould process, hand lay-up techniques, structural laminate vacuum bag and autoclave processing, filament winding, pultrusion, pulforming, thermo-forming, injection molding, resin transfer molding.

Module-2

Fabrication of composites

Cutting: machining, drilling, mechanical fasteners and adhesive bonding: design guidelines for adhesive bonding.

Mechanical joining: design parameters for bolted joints, waterjet and laserjet cuttings. Challenge during machining of composites, failure mode during machining. Cutting tools and fabrication equipment.

Module-3

Structural application of composites

Aerospace, air craft and military, medical, sporting goods and recreation, automotive. Marine, infrastructure.

Micro analysis of a uni-directional lamina: definition of volume and mass fractions, density and void content. Derivation for longitudinal, transverse and shear modulus. Major and minor Poission'sratio's.

Module-4

Study properties of MMC's

Physical Mechanical, wear, machinability and other properties. Effect of size, shape and distribution of particulate on properties. Advanced composites such as Polymer based Sandwich structures. Introduction to shape memory alloys.

Module-5

Study of composite materials from natural resources

Introduction to natural composites: classification of natural fibers: plant, animal, mineral fibers and their sources; silk, human, feather, jute, sisal, flax, cotton, bamboo fibres. Advantages and disadvantages of natural fibres. Characteristics of natural fibres. Extraction of plant fibres. Recent developments in natural fibre composites, feature potential of natural fibre composites.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

1. Understand the basics of composite materials.
2. Understand the differences between different compositions.
3. Find properties of composite materials and its impact.
4. To fabricate composite material
5. Define about natural composites.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Composite Science and Engineering, K.K.Chawla, Springer Verlag, 1998
2. Introduction to composite materials, Hull and Clyne, Cambridge University Press, 2nd Edition 1990
3. Composite Materials hand book, MeingSchwaitz, McGraw Hill Book Company, 1984
4. Mechanics of composites, Autar K kaw, CRC Press,2002.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=H1SIpk0h4-Q
- https://www.youtube.com/watch?v=slgtMk8k4lk
- https://www.science.org.au/curious/technology-future/composite-materials
- https://www.spiedigitallibrary.org/conference-proceedings-of-spie/10596/1059603/Current-and- future-needs-and-research-for-composite-materials-NDE/10.1117/12.2291921.full?SSO=1
- https://www.youtube.com/watch?v= m29-u37TI8

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

• Make the students to fabricate composite material using available resources in respective lab.
• Take the students to nearest composite industry.
• Group discussion and quiz on the subject in class.

Sustainable Manufacturing		Semester	**IV**
Course Code	**BIP405D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- To be acquainted with sustainability in manufacturing and its evaluation.
- To provide knowledge in environment and social sustainability.
- To provide the student with the knowledge of strategy to achieve sustainability.
- To familiarize with trends in sustainable operations.
- To create awareness in current sustainable practices in manufacturing industry.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
- Encourage collaborative Learning (Group Learning) in the class.
- Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking

Module-1

Economic Sustainability

Industrial Revolution-Economic sustainability: globalization and international issues Sustainability status - Emerging issues- Innovative products- Reconfiguration manufacturing enterprises - Competitive manufacturing strategies - Performance evaluation- Management for sustainability -Assessments of economic sustainability.

Module-2

Social And Environmental Sustainability

social sustainability – Introduction-Work management -Human rights - Societal commitment -Customers - Business practices -Modelling and assessing social sustainability. Environmental issues pertaining to the manufacturing sector: Pollution - Use of resources - Pressure to reduce costs - Environmental management: Processes that minimize negative environmental impacts - environmental legislation and energy costs - need to reduce the carbon footprint of manufacturing Operations-Modelling and assessing environmental sustainability.

Module-3

Sustainability Practices

Sustainability awareness - Measuring Industry Awareness-Drivers and barriers –Availability of sustainability indicators -Analysis of sustainability practicing -Modeling and assessment of sustainable practicing -Sustainability awareness -Sustainability drivers and barriers - Availability of sustainability indicators- Designing questionnaires- Optimizing Sustainability Indexes-Elements –Cost and time model.

Module-4

Manufacturing Strategy For Sustainability

Concepts of competitive strategy and manufacturing strategies and development of a strategic improvement programme - Manufacturing strategy in business success strategy formation and formulation - Structured strategy formulation - Sustainable manufacturing system design options - Approaches to strategy formulation - Realization of new strategies/system designs.

Module-5

Trends In Sustainable Operations

Principles of sustainable operations - Life cycle assessment manufacturing and service activities - Influence of product design on operations - Process analysis – Capacity management - Quality management -Inventory management - Just-In-Time systems - Resource efficient design - Consumerism and sustainable well-being.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

- Discuss the importance of economic sustainability.
- Describe the importance of sustainable practices.
- Identify drivers and barriers for the given conditions.
- Formulate strategy in sustainable manufacturing.
- Plan for sustainable operation of industry with environmental, cost consciousness.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Ghosh Roy M.K., "Sustainable development", Ane books pvt ltd.
2. Karpagam M and Jaikumar G., Ane books pvt ltd.
3. Mishra S P and Pandey S N"Essential Environmental Studies" Sheth Publishers.

References

4. Davim J.P., "Sustainable Manufacturing", John Wiley & Sons., United States, 2010, ISBN: 978-1-848-21212-1.
5. Ibrahim Garbie, "Sustainability in Manufacturing Enterprises Concepts, Analyses and Assessments for Industry 4.0", Springer International Publishing., United States, 2016,
6. ISBN-13: 978-3319293042.
7. Jovane F., Ęmper, W.E. and Williams, D.J., "The ManuFuture Road: Towards Competitive and Sustainable High-Adding-Value Manufacturing", Springer,2009, United States, ISBN 978-3-540-77011-4.
8. Kutz M., "Environmentally Conscious Mechanical Design", John Wiley & Sons., United States, 2007, ISBN: 978-0-471-72636-4.
9. Seliger G., "Sustainable Manufacturing: Shaping Global Value Creation", Springer, United States, 2012, ISBN 978-3-642-27289-9.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Ability Enhancement Course / Skill Enhancement Course - IV

Essentials of New Product Development		Semester	**IV**
Course Code	**BIP456A**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	01
Examination type (SEE)	**Theory**		

Course objectives:

- To enable the students to understand the new products and strategies.
- To help the students focus on and analyse value and cost accounting.
- To develop relevant skills necessary for cost calculation.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
- Encourage collaborative Learning (Group Learning) in the class.
- Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
- Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Introduction:

New products, new product strategy -market definition Idea generation.

Manufacturing Planning: Selection of optimum process, standardization. Break even analysis.

Module-2

Value Analysis:

Steps in selection, analysis and implementation, Selection of cutting speed for optimum cost -problems.

Module-3

Cost Accounting:

Cost estimation -difference -types -steps involved in cost estimation.

Module-4

Types of Cost:

Cost Centers, Direct –Indirect, Material cost -direct indirect material cost Overhead cost.

Module-5

Cost Calculation: Cost calculation for machined components, welding, casting and forged components illustrations - calculation of sales cost.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

1. Understand the new product concepts.
2. Understand the manufacturing planning.
3. Understand the different types of cost.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. **Design and Marketing of New Products** - Glen L Urban - John R Hauser- Prentice Hall. New Jersey, 1980.
2. **Production and Costing** - Narang CBS & Kumar V - Khanna Publishers- 2001.
3. **Cost management in the New Manufacturing Age** -Yasuhiro Monden, ProductivityPress-1992.

Web links and Video Lectures (e-Resources):

- https://www.wallstreetmojo.com/value-analysis/
- https://www.netsuite.com/portal/resource/articles/financial-management/break-even-analysis.shtml#:~:text=A%20break%2Deven%20analysis%20is,cover%20all%20of%20your%20costs.
- https://icmai.in/upload/CASB/2017/CAS15.pdf

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

• At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

An overview of Quality Improvement Tools		Semester	**IV**
Course Code	**BIP456B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	01
Examination type (SEE)	**Theory**		

Course objectives:

- Foundation for understanding of composite materials.
- Exposer to the fabrication of composites.
- To impart the knowledge of structural applications of composites.
- To learn Micro analysis of unidirectional lamina.
- To learn the study properties of MMC's.
- To impart the knowledge for applications of natural composites

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Encourage collaborative Learning (Group Learning) in the class.
3. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
4. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Introduction: Total Quality Control and The Seven New QC Tools Relation diagram, KJ method (affinity diagram), Systematic diagram, Matrix diagram, Matrix data analysis, Process decision program chart (PDPC), Arrow diagram.

Module-2

Seven QC Tools: Applying the Seven New QC Tools, Affinity diagram, Need, Process and Examples.

Module-3

Systematic diagram and matrix diagram, Need, Process, Examples

Module-4

Matrix data analysis, PDPC & arrow diagram method: Need, Process, Examples

Module-5

Education to introduce the seven new QC tools conclusion: Implementation of seven new QC tools, Strategic Plan for implementation of seven new QC tools.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

- Increased customer or staff satisfaction
- Increased reach to a target population
- Dissemination of information, products, or evidence-based practices
- Quality enhancement of services or programs;
- Quality enhancement of data systems
- Organizational design improvements

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. MANAGEMENT FOR QUALITY IMPROVEMENTS, Norman Bodek Shigeru Mizuno,
2. Quality Management for Organizations Using Lean Six Sigma Techniques, Erik Jones, 1st Edition

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=rIF8E5O1RUI
- https://asq.org/quality-resources/affinity#:~:text=The%20affinity%20diagram%20organizes%20a,%2C%20complex%20issue%2C%20or%20problem.
- https://www.youtube.com/watch?v=R5xITJk_V90
- https://www.youtube.com/watch?v=QOy2gYuWxSc
- https://www.youtube.com/watch?v=-uc7jRFuOQQ
- https://www.youtube.com/watch?v=0hzqHwu1i_I
- https://www.youtube.com/watch?v=QJVHNvoKyJM
- https://www.4cpl.com/blog/7-qc-tools-for-quality-improvement-with-a-strategic-plan/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Basics of Financial Management		Semester	**IV**
Course Code	**BIP456C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	01
Examination type (SEE)	**Theory**		

Course objectives:

- Provide the learner with an in-depth understanding of the link between company decision-making and theoperation of capital markets
- Ensure the learner understands and appreciates the strong linkages between finance and globalisation
- Demonstrate the importance of working capital management and the tools to manage it
- Help the learner to explore the financial environment in which firms and managers must operate.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain concepts
3. Encourage collaborative (Group Learning) Learning in the class
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking
5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develops thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Financial system: significance and definition, perfect capital market, types of markets, liberalisation of the financial system, Factors determining savings, financial liabilities, savings rate in ninth and 10th plan, financial intermediation, payment and settlement system.

Module-2

Reserve Bank of India: Introduction to central banking, instruments of monetary control, reserve bank of India, public debt, secondary debt market, reserve requirements, selective credit control, advances to priority sector, supervision system.

Module-3

Merchant banking: Introduction, banking commission report (1972), Merchant banking in India, origin of merchant banking abroad, regulation of merchant banking.

Mutual funds: Mutual funds in India, types of mutual funds, GETFs, Written from mutual funds, mutual fund holders account, recommendations of the study group.

Module-4

Money market: Features of money market, instruments, secondary market for money market instruments **Foreign exchange market:** Market regimes and trade, trade in foreign exchange market, impact of technology on trading, speculation, foreign exchange rates, market makers, transaction cost, forward exchange rates, cross rates, spot exchange : settlement procedure, currency arbitrate, nominal, real, affective exchange rates, edging exchange risk, definition of exchange risk, edging with options.

Module-5

Primary market: Introduction, instruments, debentures, credit rating of debt instruments, preference shares, equity shares, public issue of securities.

Secondary market: stock exchanges: Introduction, growth of stock exchanges, growth pattern of listed stock, stockbrokers, functions of a stock exchange.

Foreign investment and its regulations: Significance and role of foreign investment, non-residential Indians Accessing international capital markets, Introduction guidelines for external commercial borrowings.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

1. Describe the financial environment within which organisations must operate
2. Critically evaluate the financial objectives of various types of organisations and the respective requirements ofstakeholders
3. Discuss the function of capital markets
4. Explain alternative sources of finance and investment opportunities and their suitability in particular circumstances
5. Assess the factors affecting investment decisions and opportunities presented to an organisation

Assessment Details (both CIE and SEE)

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Semester End Examinations (SEE)

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3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. Indian financial system, M Y Kham, 7th edition.
2. Indian financial system, H R Machiraju, fourth edition, Vikas publications.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=gqcXs6HoAnY
- https://www.youtube.com/watch?v=5ld2x94RuH0
- https://www.youtube.com/watch?v=iHFfX0AnlvY
- https://www.youtube.com/watch?v=EU-NyBxHuGU
- https://www.youtube.com/watch?v=5YkYJqQjWI4
- https://www.youtube.com/watch?v=_p3-sVHulmM
- https://www.youtube.com/watch?v=C0Ktvoh-oFM
- https://www.youtube.com/watch?v=GPibEnh6HiA
- https://www.youtube.com/watch?v=Nonw1yiWEWs
- https://www.youtube.com/watch?v=czO-HIgdxiQ
- https://www.youtube.com/watch?v=d4PxM_Jug0E
- https://www.youtube.com/watch?v=agk5fW7eq3M

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Group discussions on Finance management.

Basics of MATLAB		Semester	**IV**
Course Code	**BIPL456D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	100
Examination type (SEE)	**Practical**		

Course objectives:

1. To know about fundamentals of MATLAB tool.
2. To provide an overview to program curve fitting & solve Linear and Nonlinear Equations.
3. To understand the concept and importance of Fourier transforms.
4. To gain knowledge about MATLAB Simulink & solve Electrical engineering problems.

Sl.NO	**Experiments**
1	**Introduction to MATLAB Programming:** Basics of MATLAB Programming, array operations in MATLAB, loops and execution of control.
2	**Working with files:** Scripts and functions, plotting and programming output, examples.
3 4	**Numerical Methods and their applications:** Curve Fitting: Straight line fit, Polynomial fit.
5 6	**Numerical Integration and Differentiation:** Trapezoidal method, Simpson method.
7	**Linear and Nonlinear Equations:** Eigen values, Eigen vectors, Solution of linear algebraic equations using Gauss Elimination and LU decomposition, Solution of nonlinear equation in single variable using Gauss-Siedal and Newton-Raphson method.
8	**Ordinary Differential Equations:** Introduction to ODE's, Euler's method, second order RungaKutta method, MATLAB ode45 algorithm in single variable and multivariables. Transforms: Discrete Fourier Transforms,
	Demonstration Experiments (For CIE)
9	**Application of MATLAB to** analyse problems in basic engineering mechanics, mechanical vibrations, control system, statistics and dynamics of different circuits.
10	**MATLAB Simulink:** Introduction to MATLAB Simulink, Simulink libraries, development of basic models in Simscape Power Systems

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

- Able to implement loops, branching, control instruction and functions in MATLAB programming environment.
- Able to program curve fitting, numerical differentiation and integration, solution of linear equations in MATLAB and solve electrical engineering problems.
- Able to understand implementation of ODE using ode 45 and execute Solutions of nonlinear equations and DFT in MATLAB.
- Able to simulate MATLAB Simulink examples

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are**50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted

jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

1. Agam Kumar Tyagi, "**MATLAB and Simulink for Engineers**", OXFORD Higher Education.
2. Dr. Shailendra Jain, "**Modeling& Simulation using MATLAB – Simulink**", Wiley – India.

Biology For Engineers		Semester	**IV**
Course Code	**BBOK407**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Universal human values course		Semester	**IV**
Course Code	**BUHK408**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	01
Examination type (SEE)	**Theory**		

National Service Scheme (NSS)		Semester	**IV**
Course Code	**BNSK459**	CIE Marks	100
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	0
Total Hours of Pedagogy	15	Total Marks	100
Credits	00	Exam Hours	--
Examination type (SEE)	**Practical**		

Physical Education (PE)		Semester	**IV**
Course Code	**BPEK459**	CIE Marks	100
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	0
Total Hours of Pedagogy	00	Total Marks	100
Credits	00	Exam Hours	--
Examination type (SEE)	**Practical**		

Yoga		Semester	**IV**
Course Code	**BYOK459**	CIE Marks	100
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	0
Total Hours of Pedagogy	00	Total Marks	100
Credits	00	Exam Hours	--
Examination type (SEE)	**Practical**		